

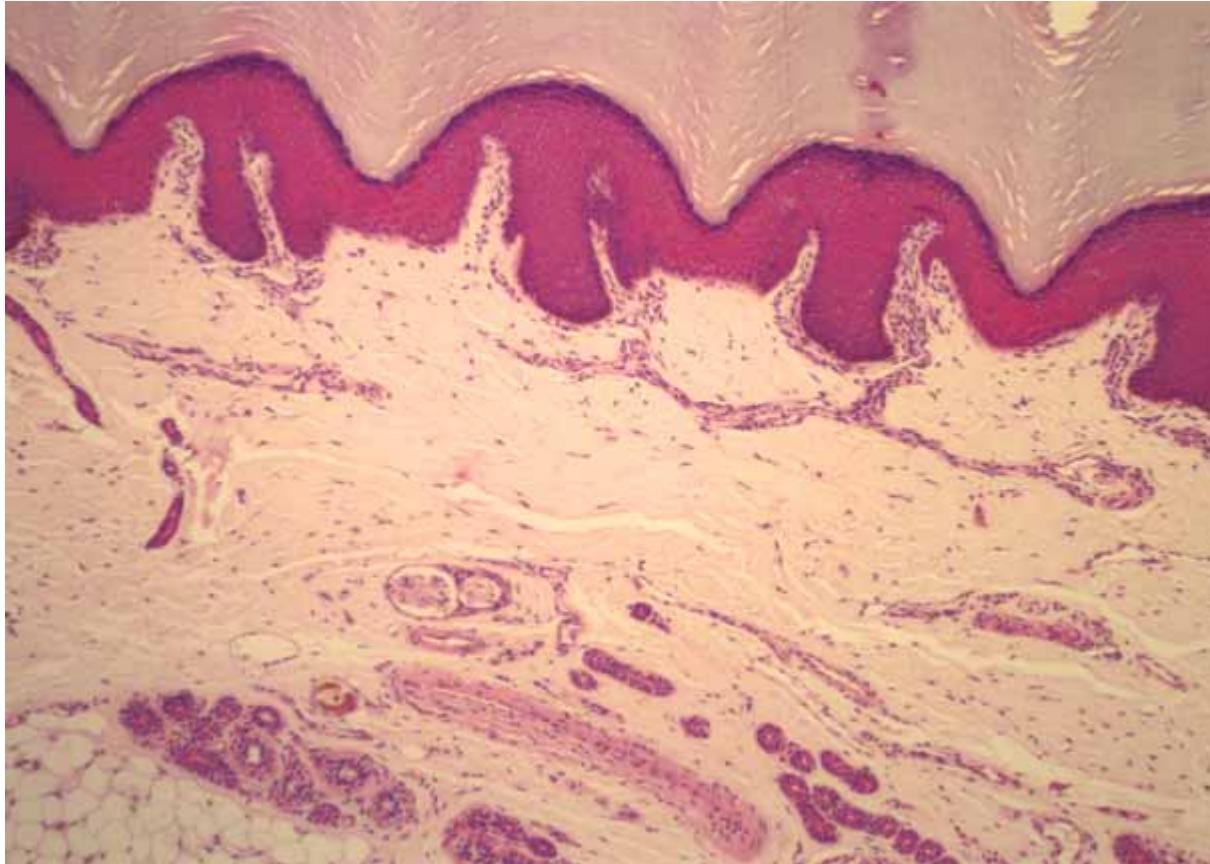
# Basic Skin Histology

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*Protection*

*Sensation*

*Thermoregulation*

*Metabolism*

# Layers of Skin

## 1) Epidermis

- stratified squamous epithelium
- epidermal ridges

## 2) Dermis

### a) papillary layer

small blood vessels, lymph & nerves

fine collagen & elastic fibers

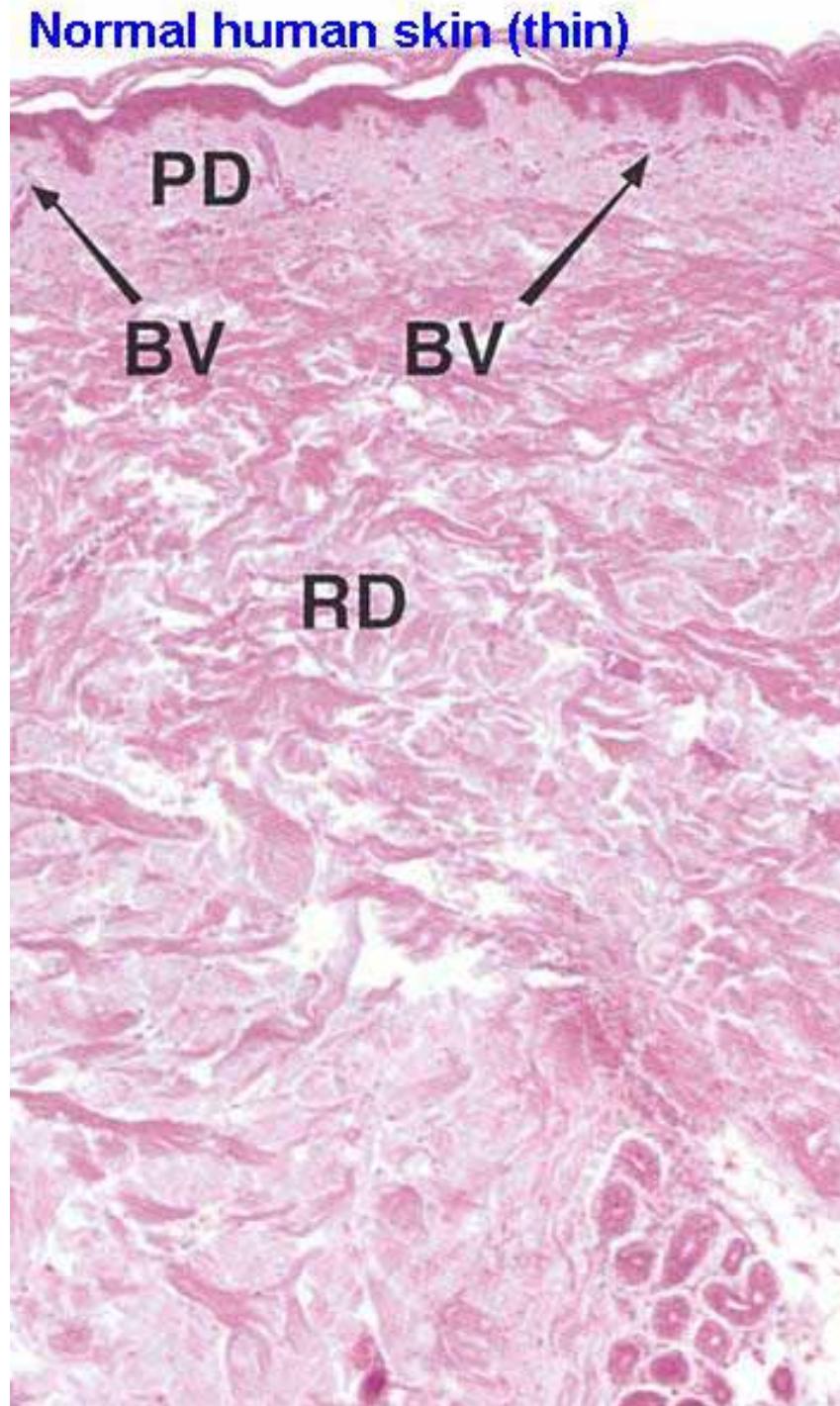
### b) reticular layer

vascular plexus, lymph, nerves & appendages

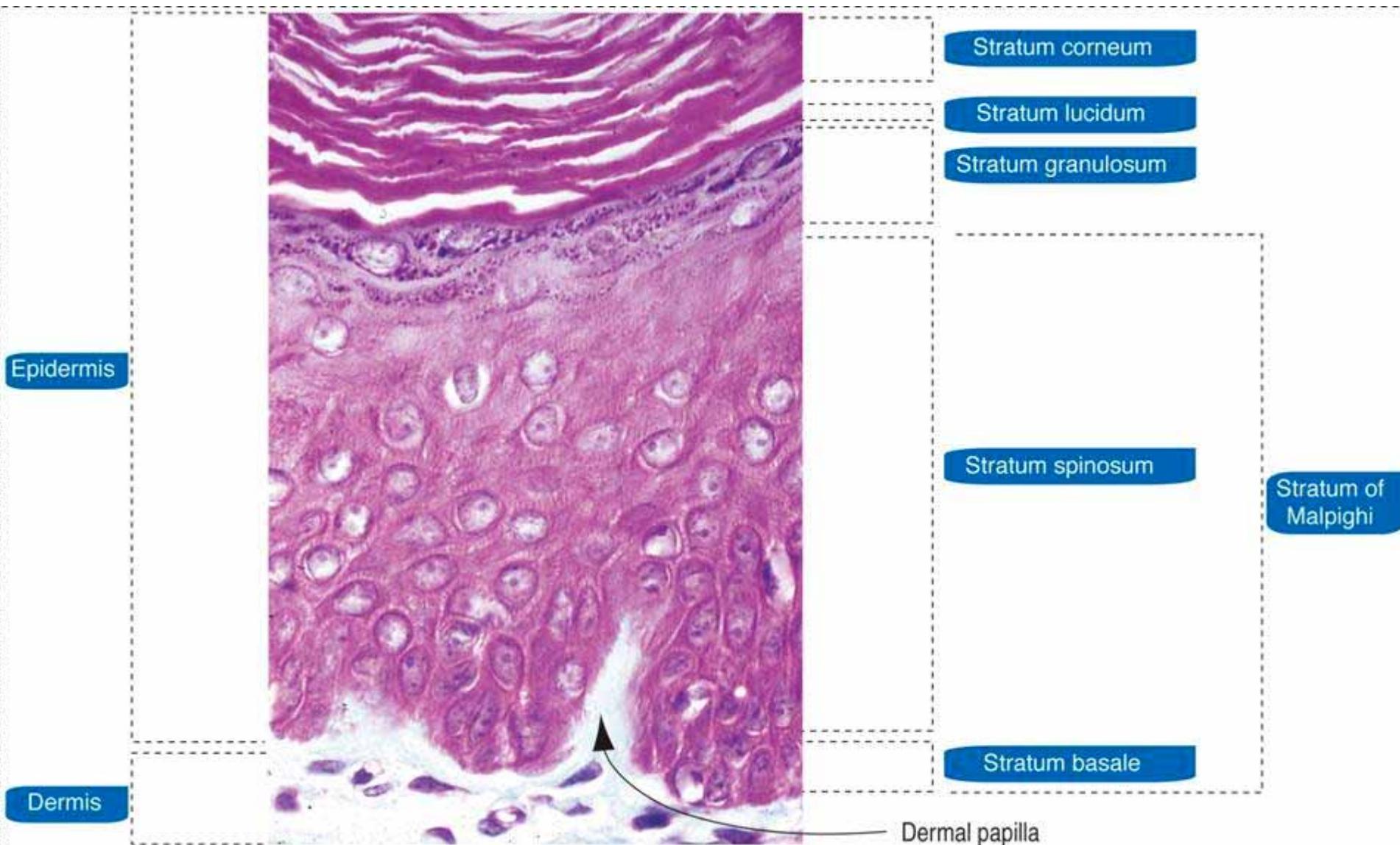
compact collagen fibers & thick elastic fibers

## 3) Hypodermis (subcutaneous)

- mainly adipose tissue

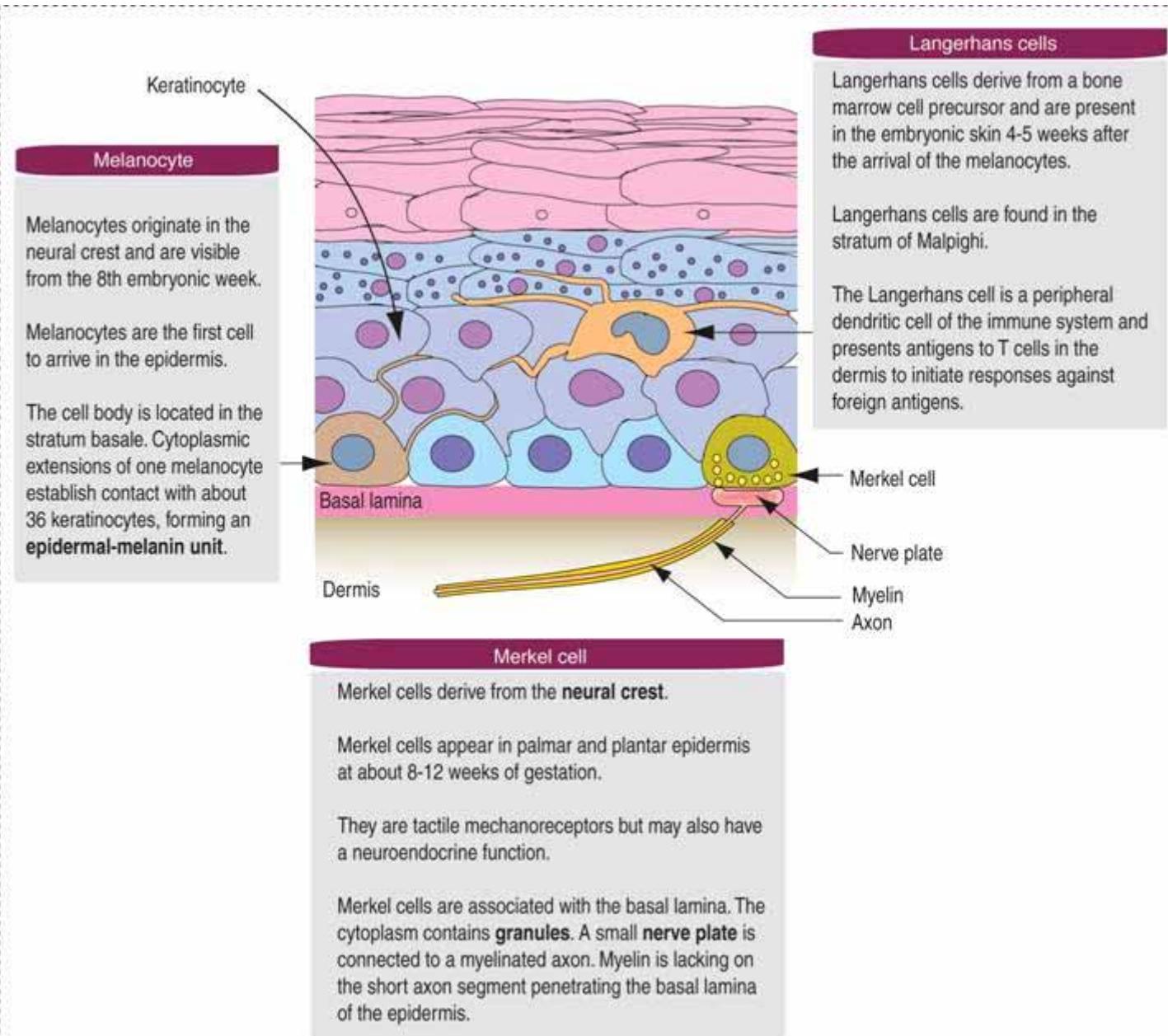


## Layers of the Epidermis of Thick Skin



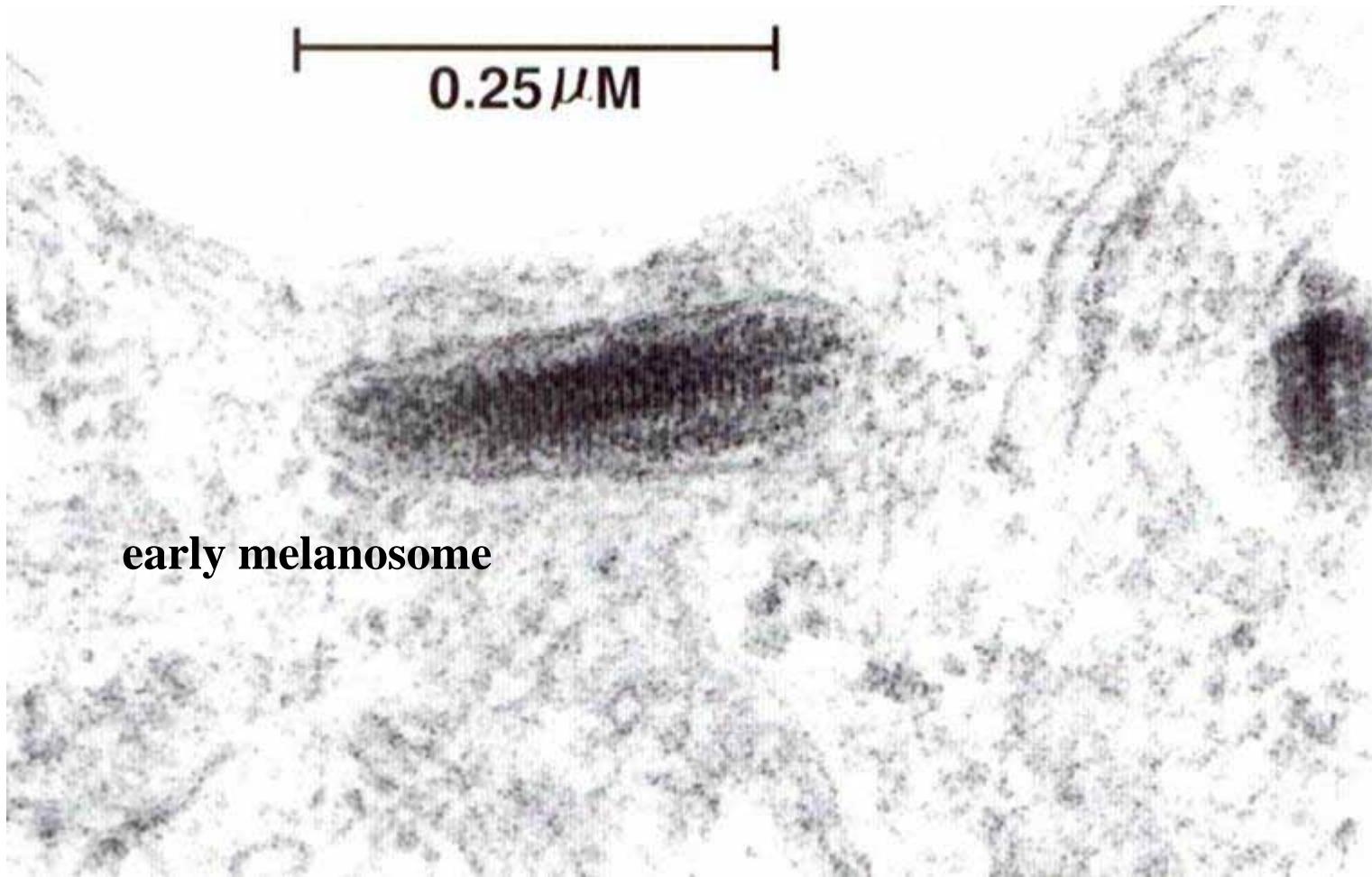
4 distinct cell types: 1) Keratinocyte, 2) Melanocyte, 3) Langerhans cell, 4) Merkel cell

# Immigrant Cells of the Epidermis



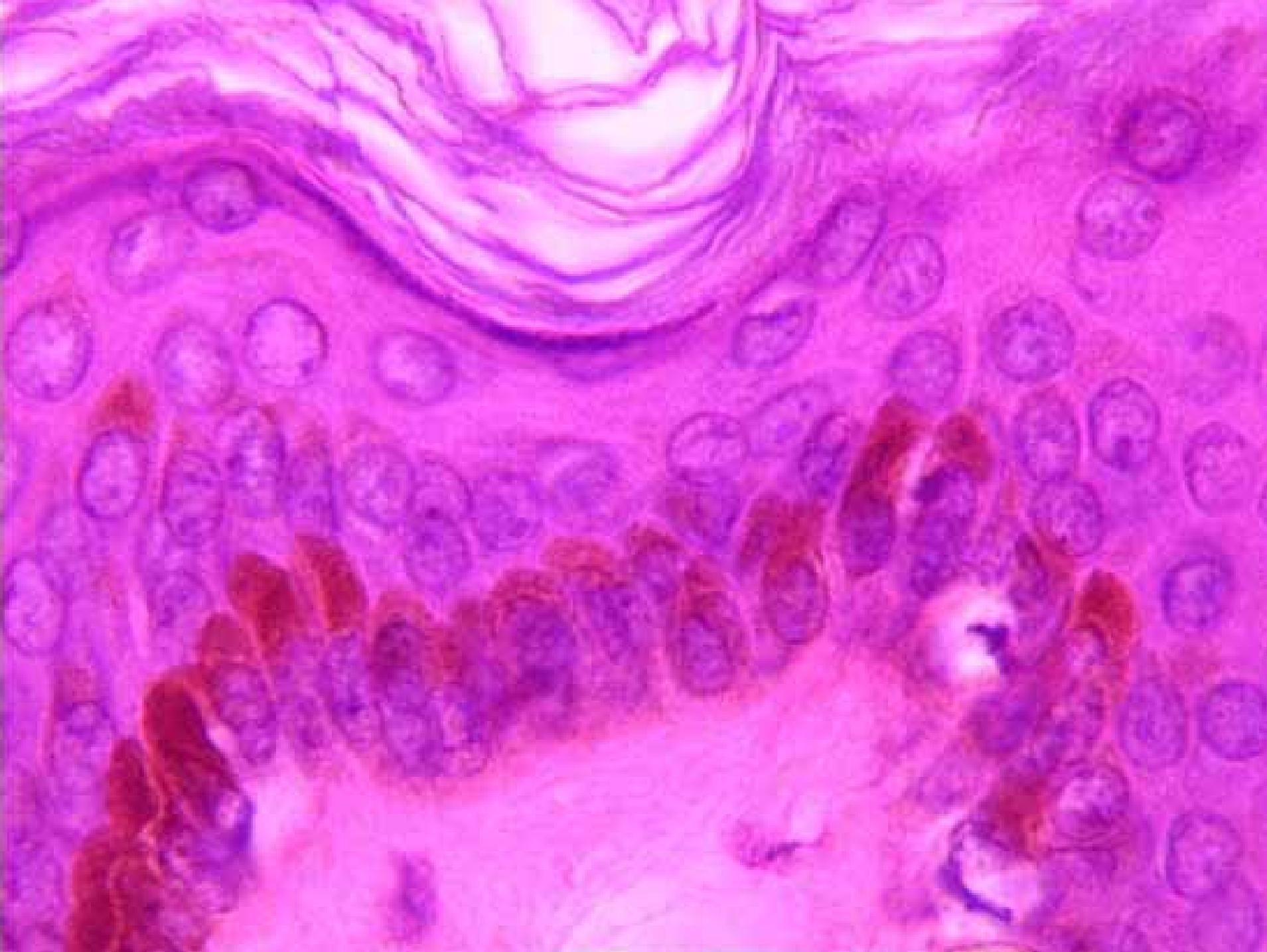


**Melanocyte:** neural crest origin; no desmosomal attachments



**early melanosome**





# Malignant Melanoma

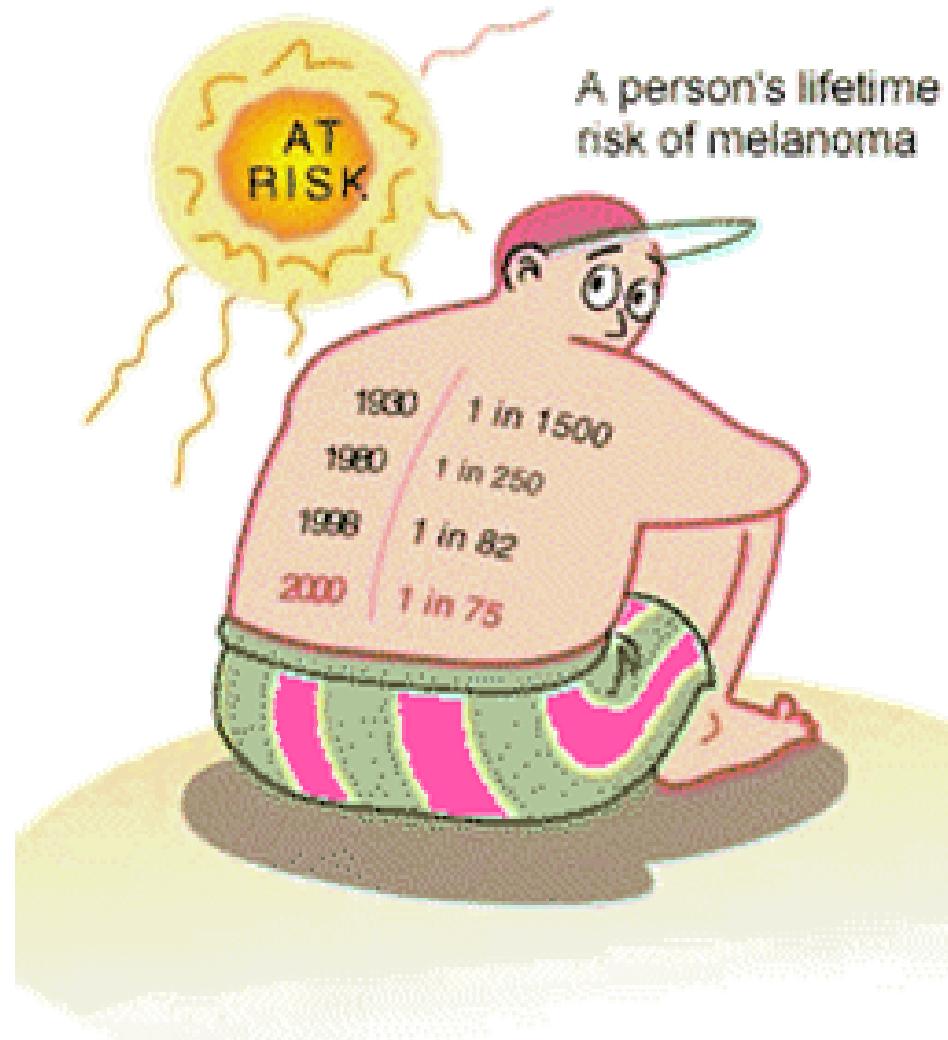
ABCD warning signs  
(American Acadamy of Dermatology):

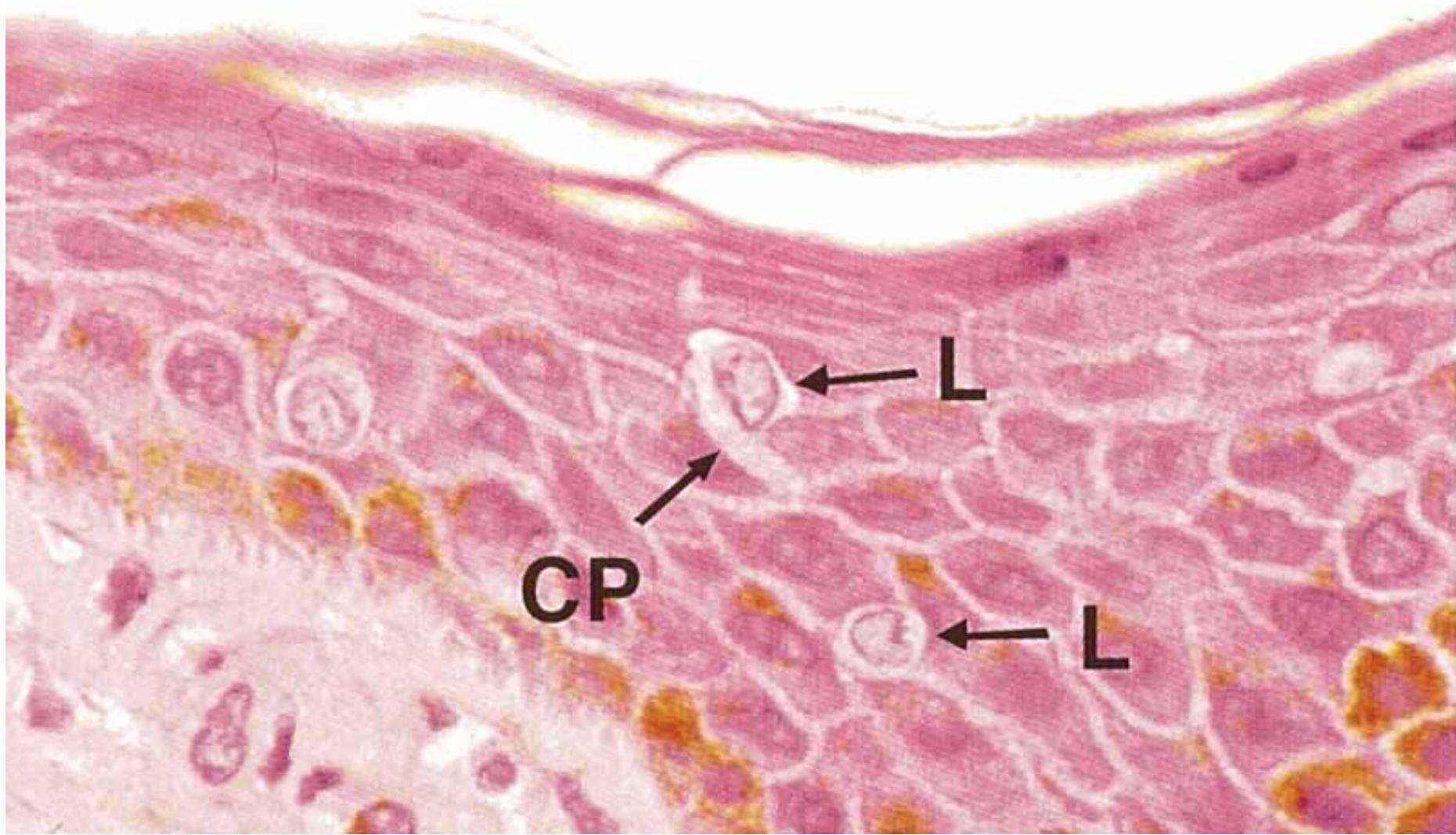
**A**symmetry

**B**order irregularity

**C**olor (non-uniform pigment)

**D**iameter (>6mm)





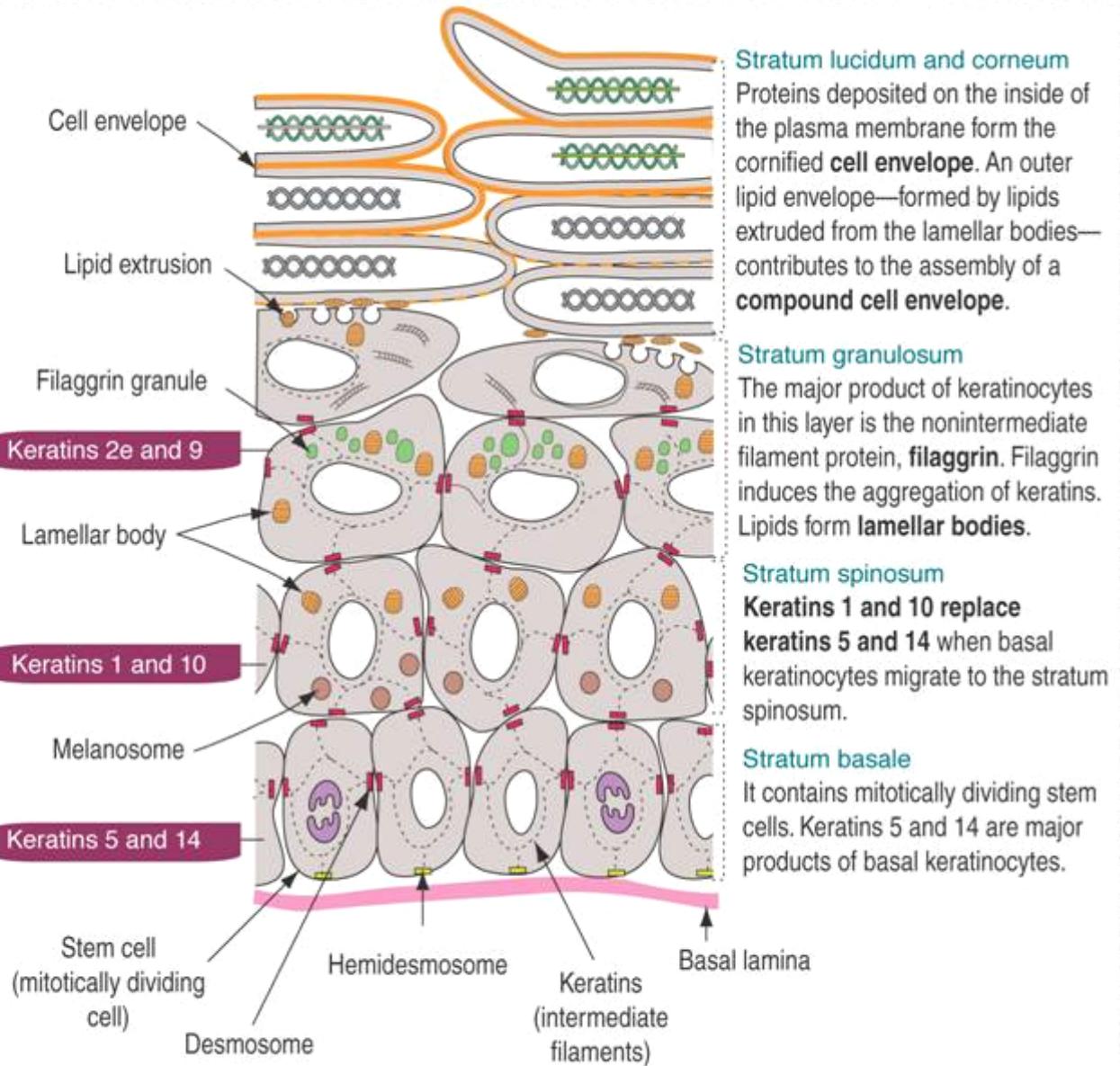
**Langerhans Cell:** dendritic processes; antigen presentation

# Keratinocyte Differentiation

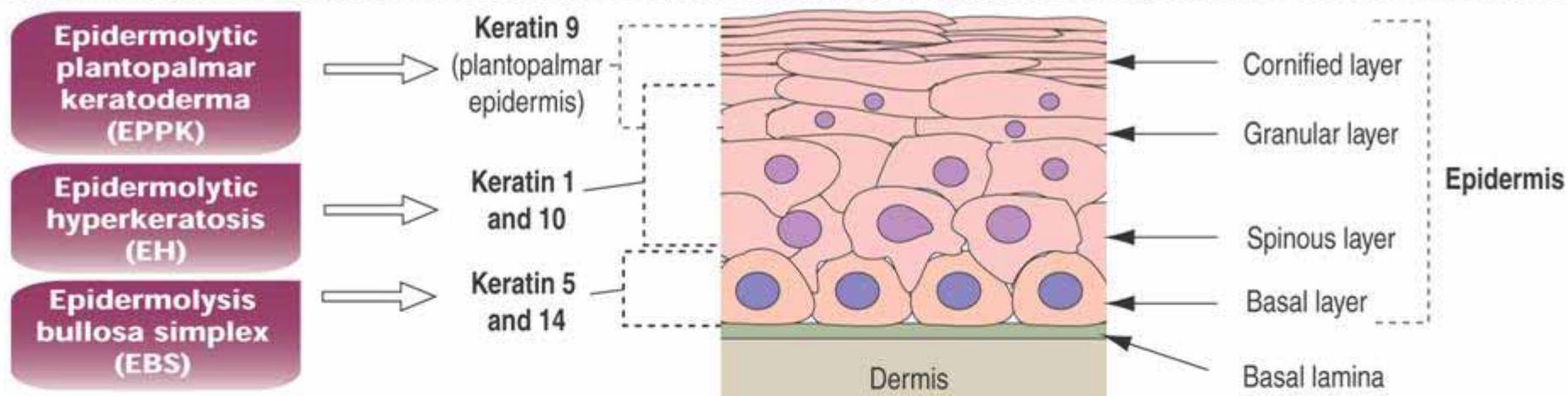
Defects of **keratin 2e** cause **ichthyosis bullosa of Siemens (IBS)**. A defect of **keratin 9** is associated with **epidermolytic palmoplantar keratoderma (EPPK)**

Mutation of **keratins 1 or 10** is the cause of **epidermolytic hyperkeratosis (EHK)**

Mutation of **keratins 5 or 14** is the cause of **epidermolysis bullosa simplex (EBS)**



# Inherited Skin Diseases Caused by Mutations in Keratin Genes



Photographs from Callen JP, et al.: Color Atlas of Dermatology. Philadelphia, WB Saunders, 1993.



**Epidermolysis bullosa simplex (EBS)**

**Mutation of keratins 5 and 14.**

Blisters develop soon after birth at sites subject to pressure or rubbing.

In the illustration above, blisters can be seen on the fingers of an infant.



**Epidermolytic hyperkeratosis (EH)**

**Mutation of keratins 1 and 10.**

Excessive keratinization causes a breakdown of the epidermis.



**Epidermolytic plantopalmar keratoderma (EPPK)**

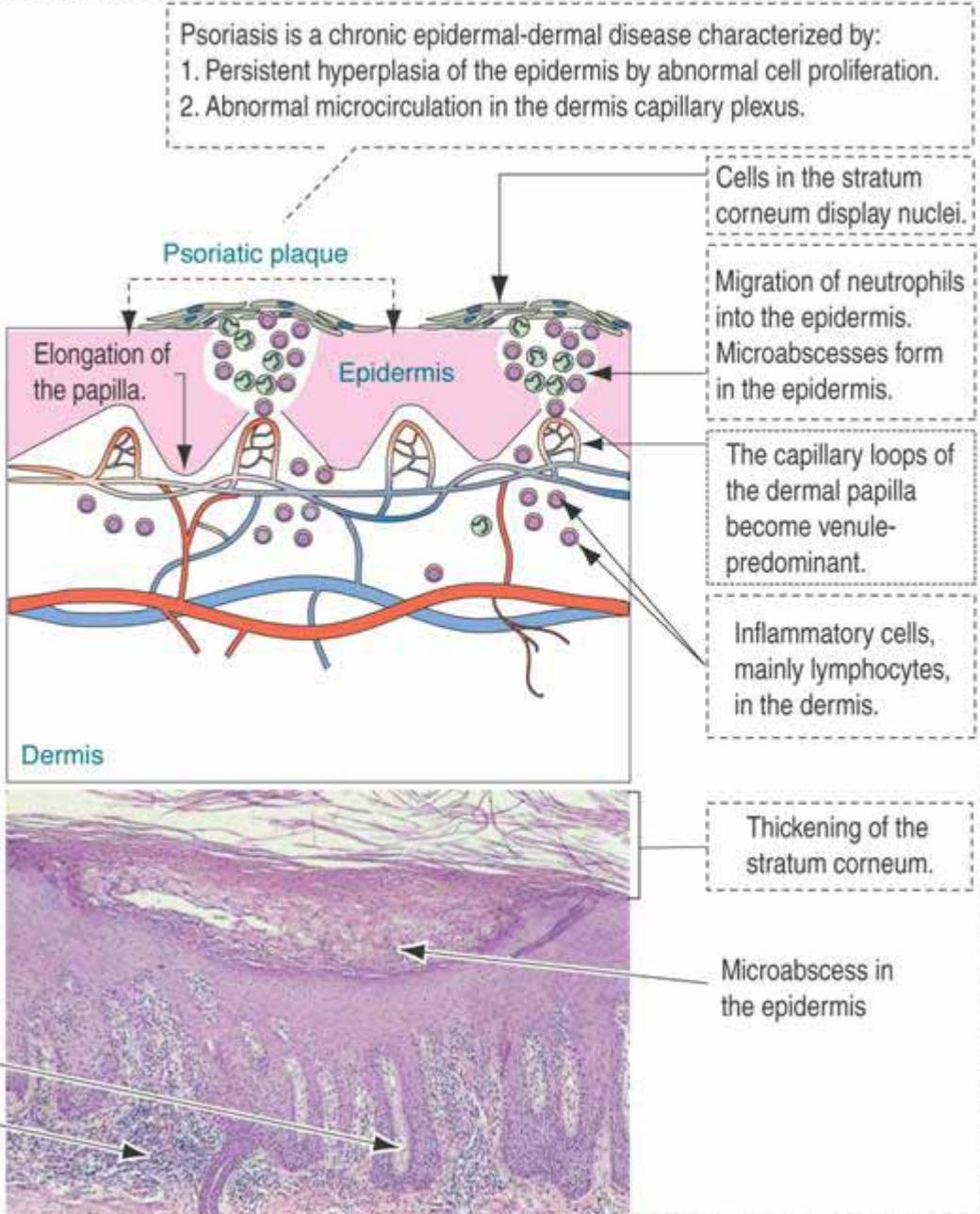
**Mutation of keratin 9.**

This disorder is restricted to the epidermis of palms and soles.

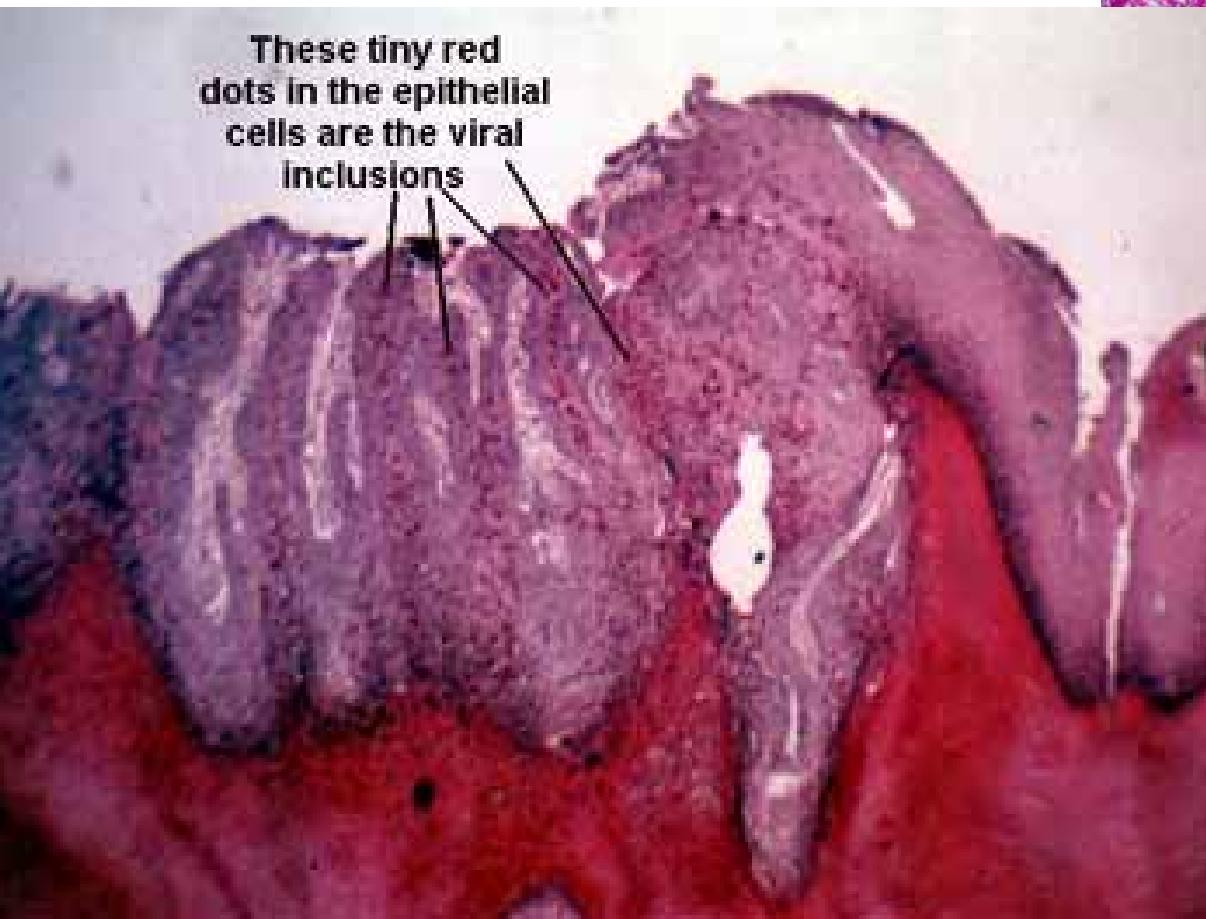
# Psoriasis



Elongation of the papillae  
Inflammatory cells in the dermis



## Verruca Vulgaris (wart)



These tiny red dots in the epithelial cells are the viral inclusions

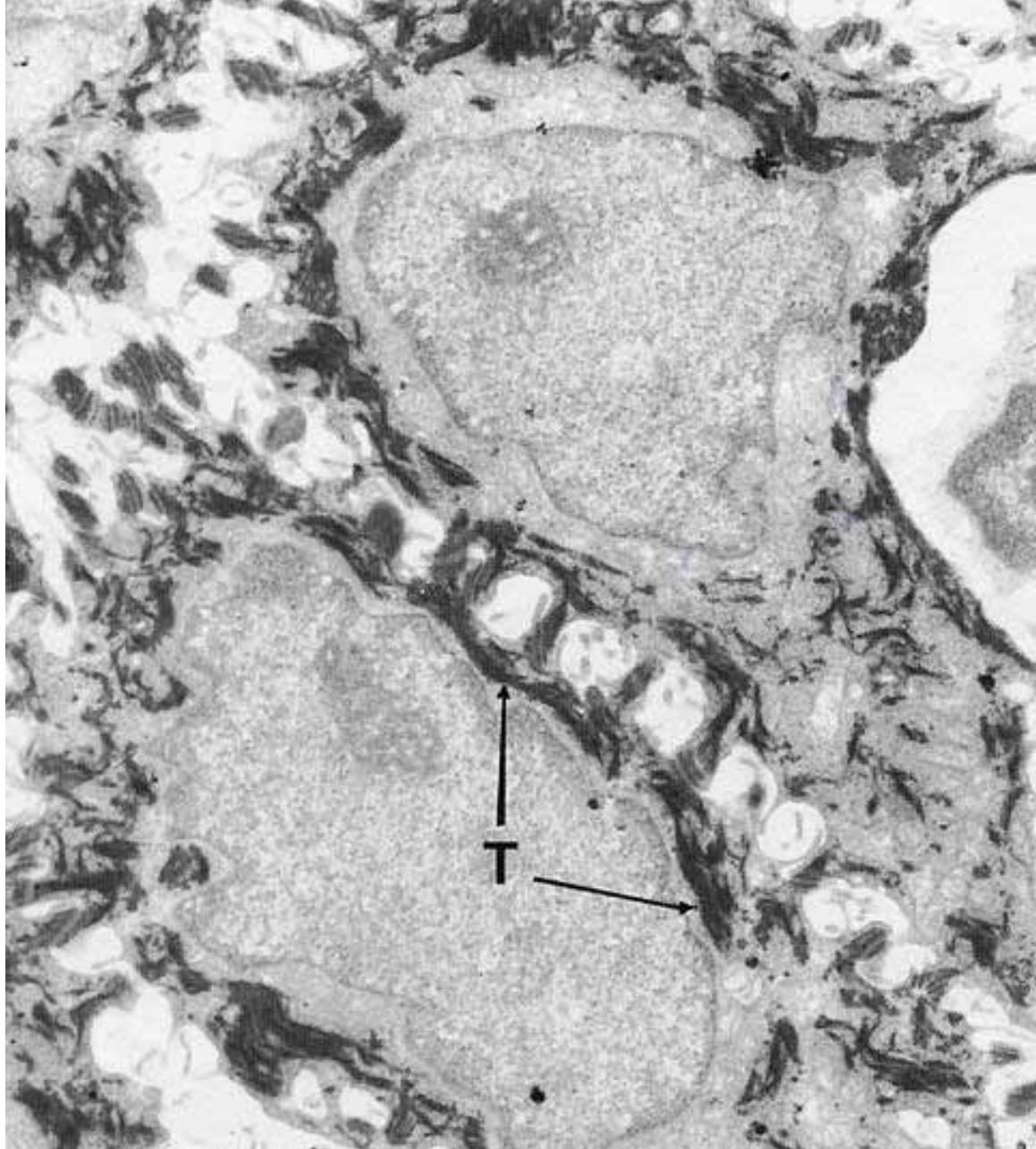
## Desmosomes in the stratum spinosum



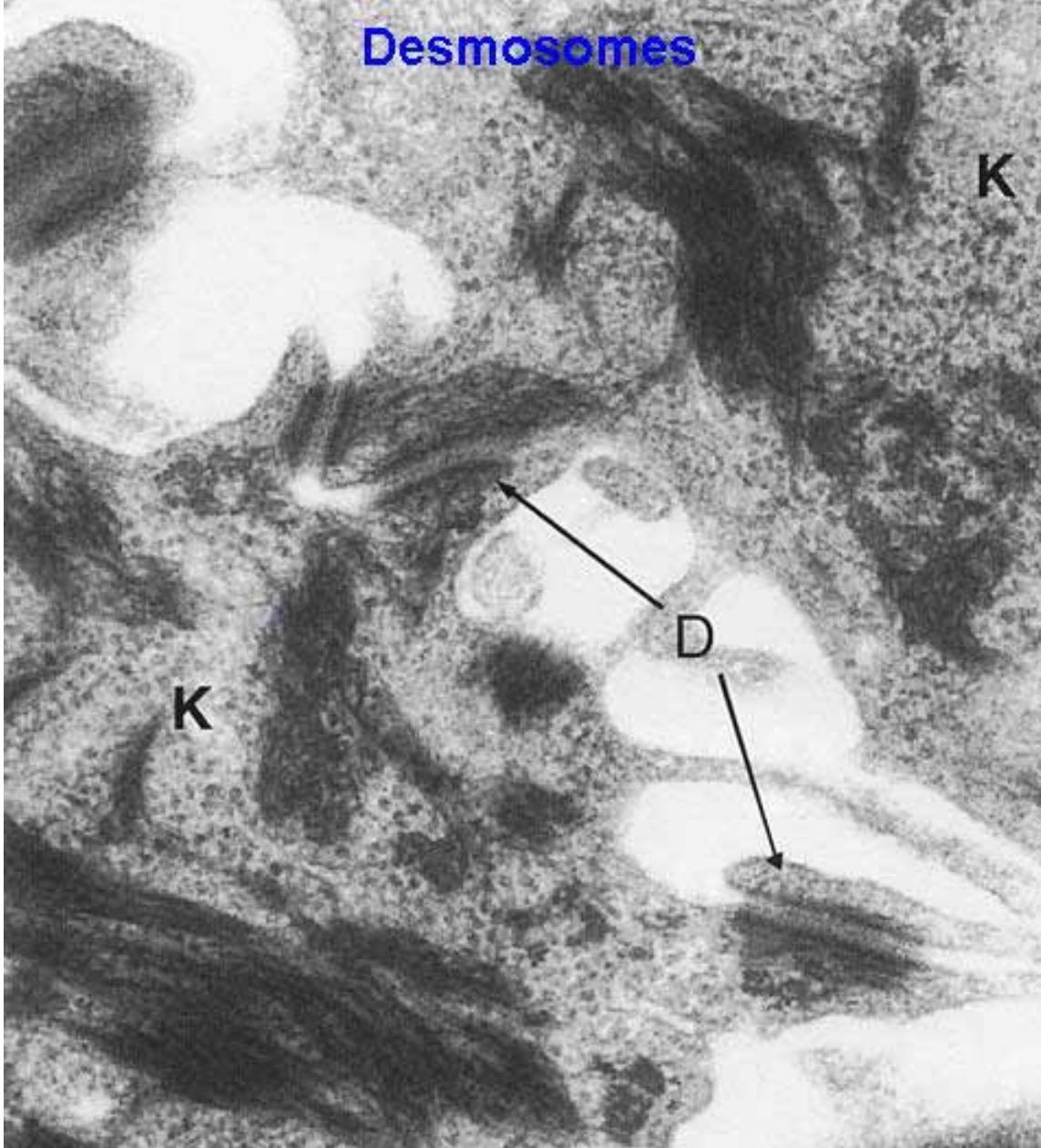
**Desmosomes:** intercellular adhesion

## Keratin Filaments

- dense cytoplasmic bundles
- crosslinked by filaggrin to form large aggregates
- concentrated at cell periphery in projections that terminate at desmosomal junctions
- crucial for structural integrity, stability, and continuity of the epithelium

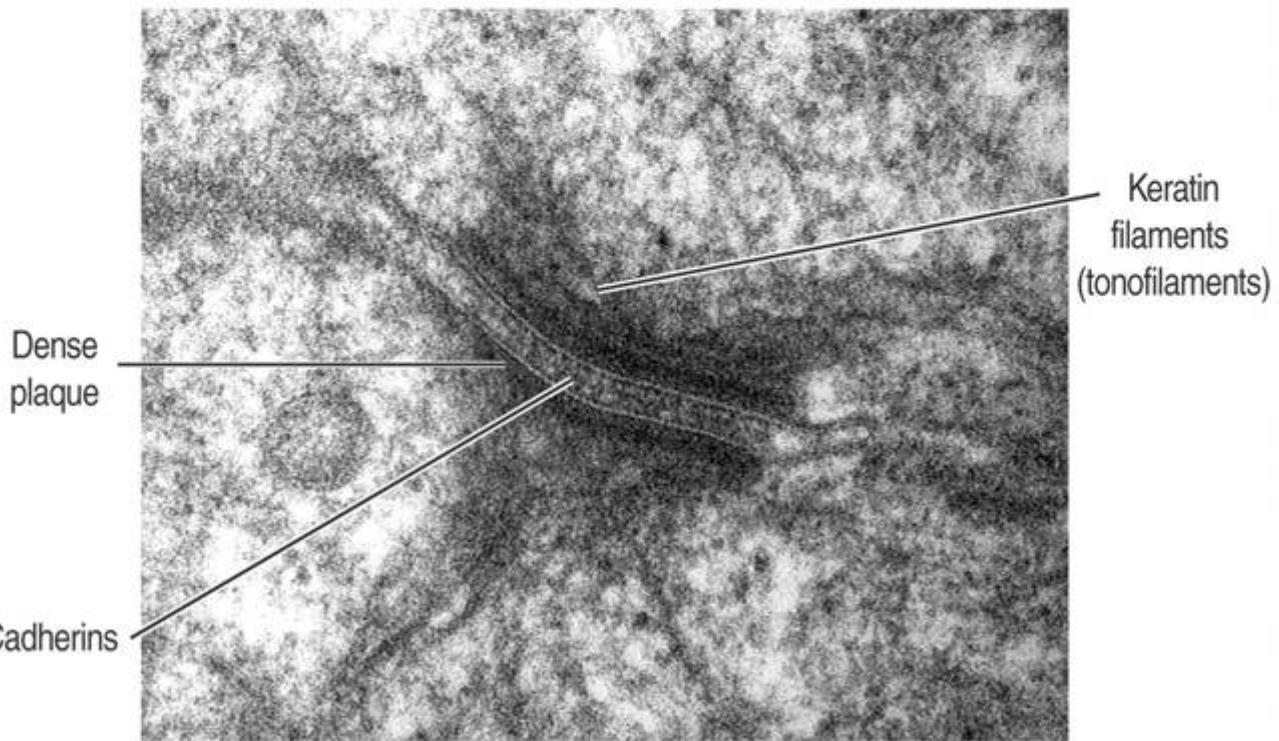
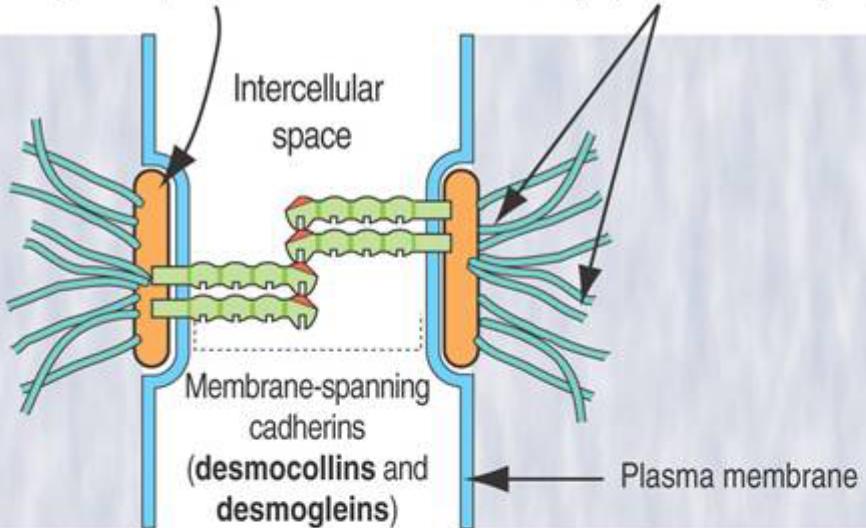


## Desmosomes



Cytoplasmic dense plaque containing desmoplakin and plakoglobin proteins

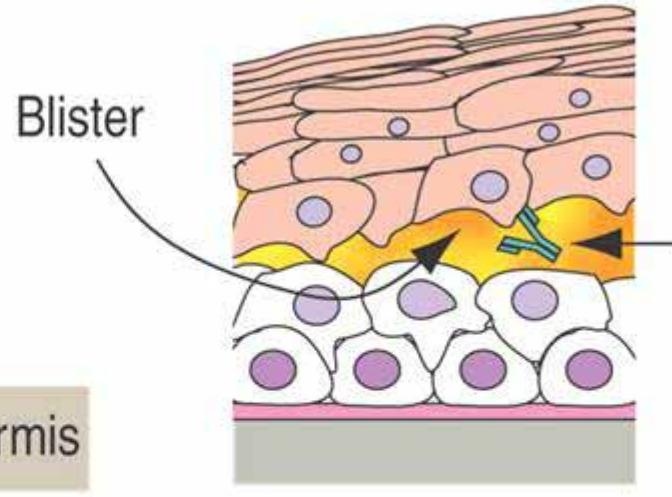
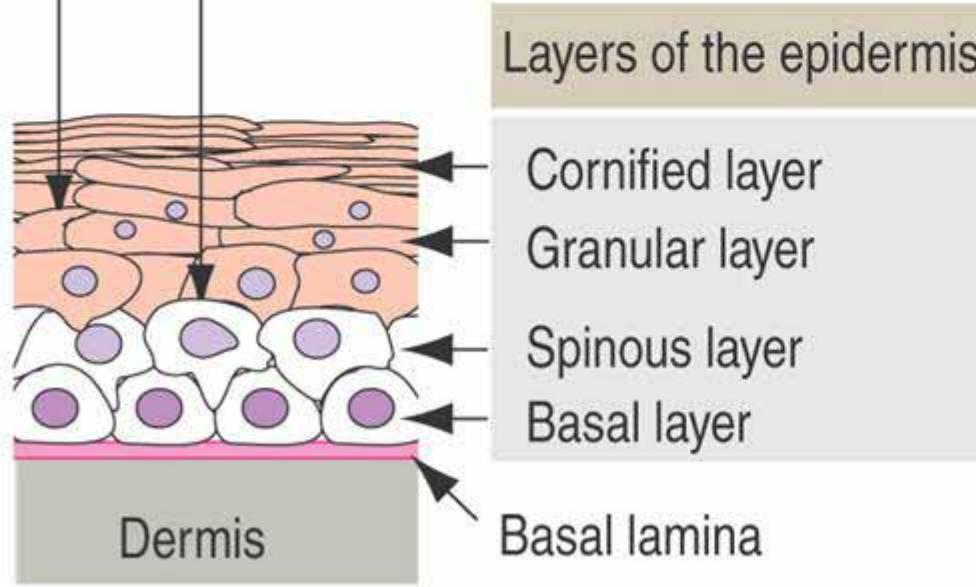
Keratin filaments (tonofilaments) anchored to the cytoplasmic dense plaque



## Desmogleins in Autoimmune Skin Disease: Pemphigus

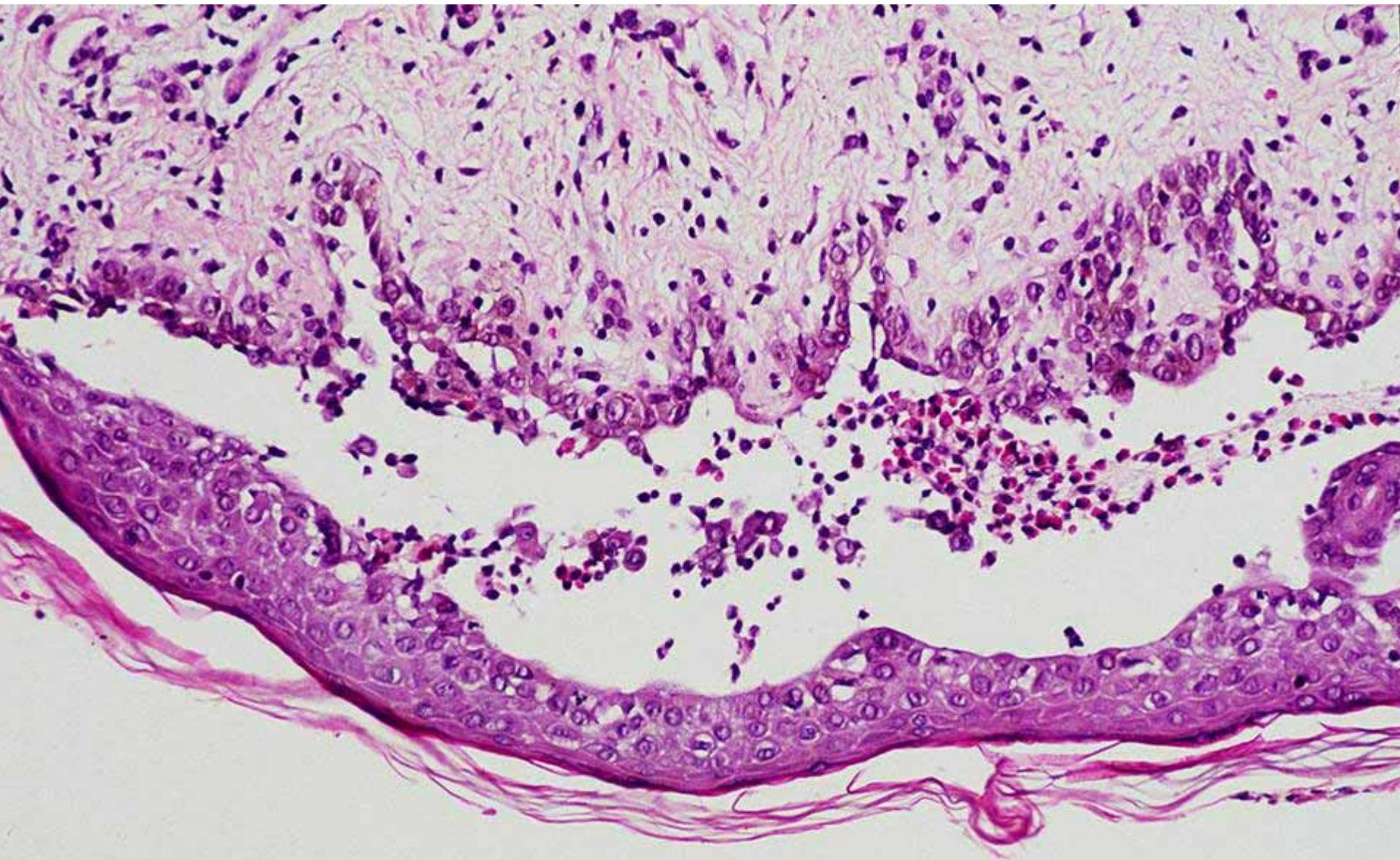
**Desmoglein 1** is present in all the layers of the epidermis.

**Desmoglein 3** is present in the basal and spinous layers.

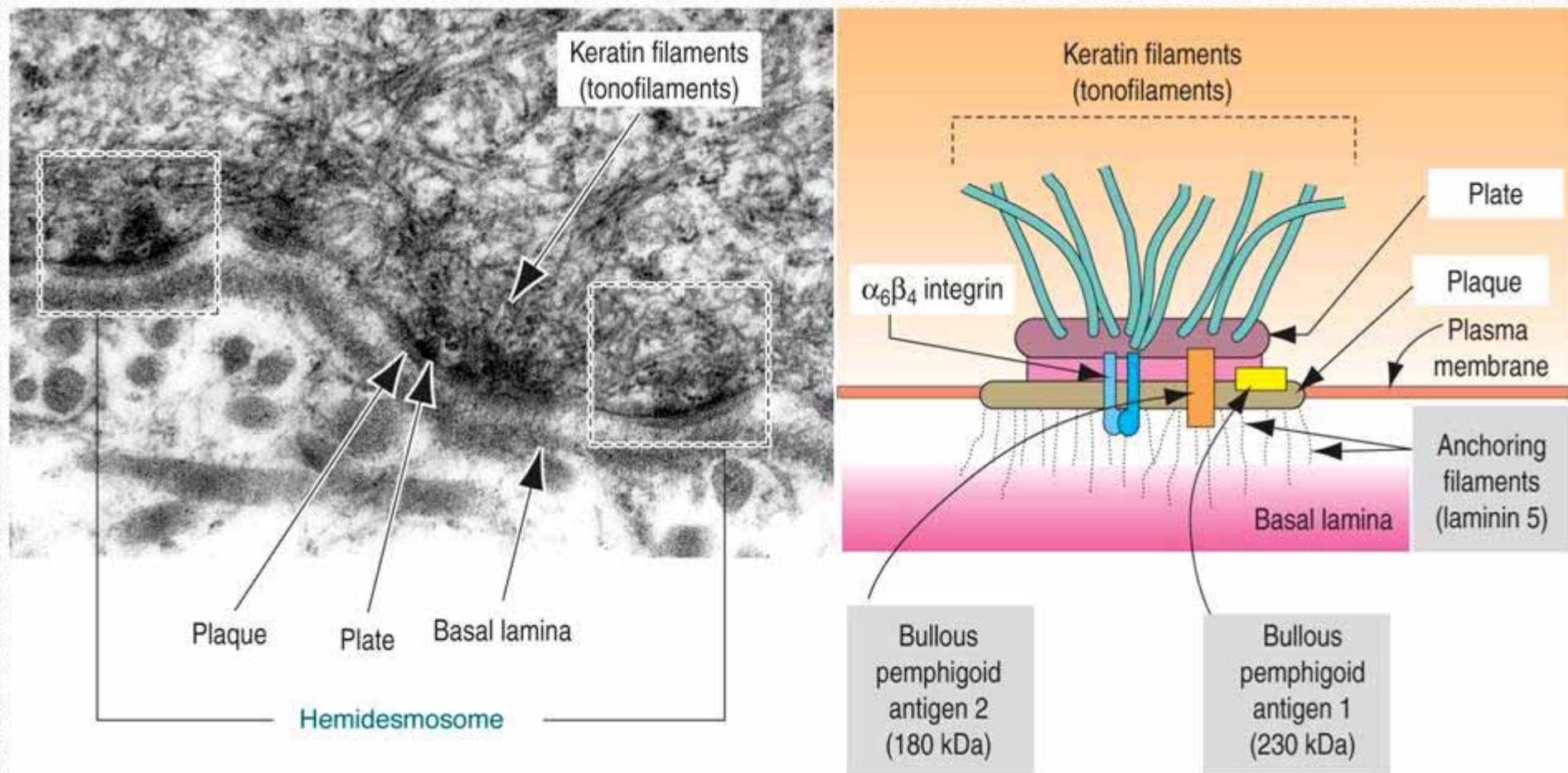


**Pemphigus foliaceus** is an autoantibody-mediated blistering disease in which antibodies against **desmoglein 1** cause a loss of adhesion of keratinocytes in the superficial layers of the epidermis.

## Pemphigus

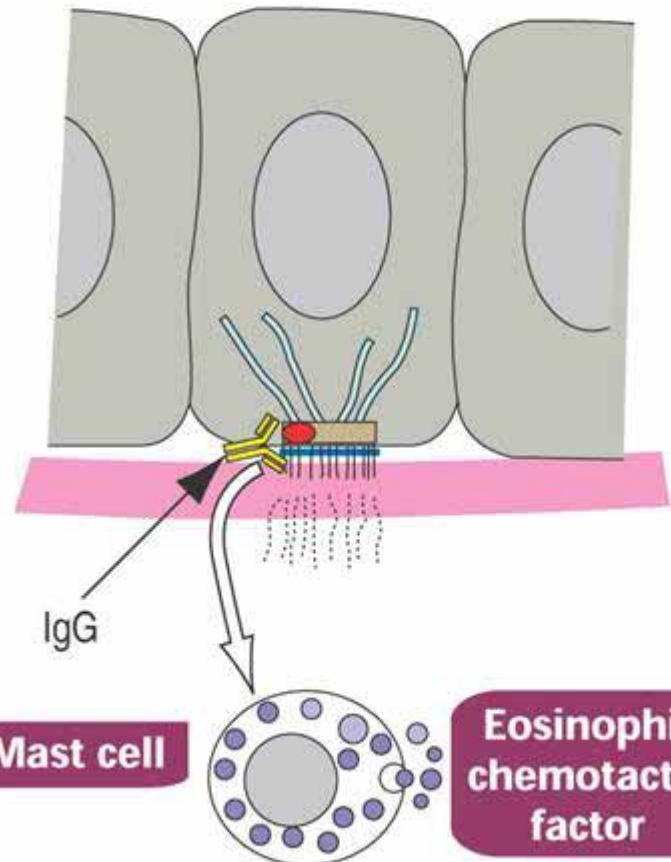


# Dermo-epidermal Junction: hemidesmosomes are also targets of autoantibodies causing blistering diseases

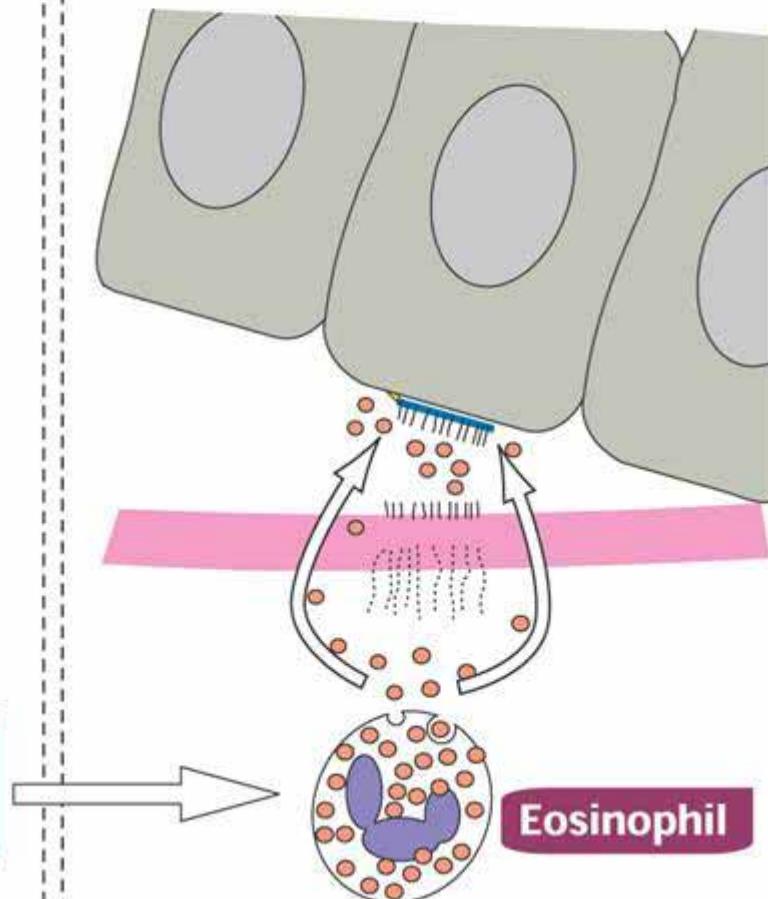


# Pathogenesis of Pemphigus Bullous

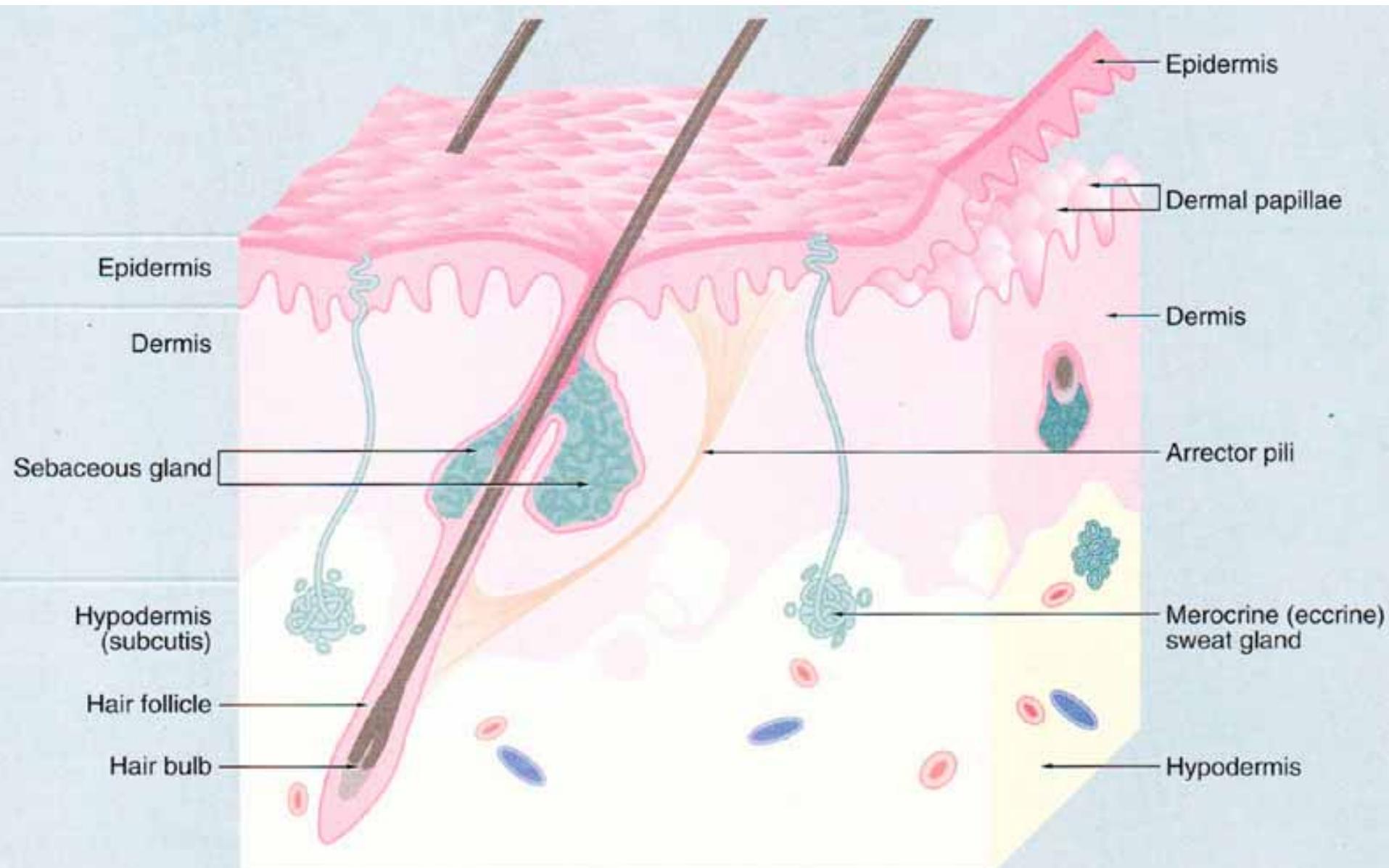
**1** A circulating antibody to bullous pemphigoid antigen triggers a local response that induces mast cells to release **eosinophil chemotactic factor (ECF)** to attract eosinophils.



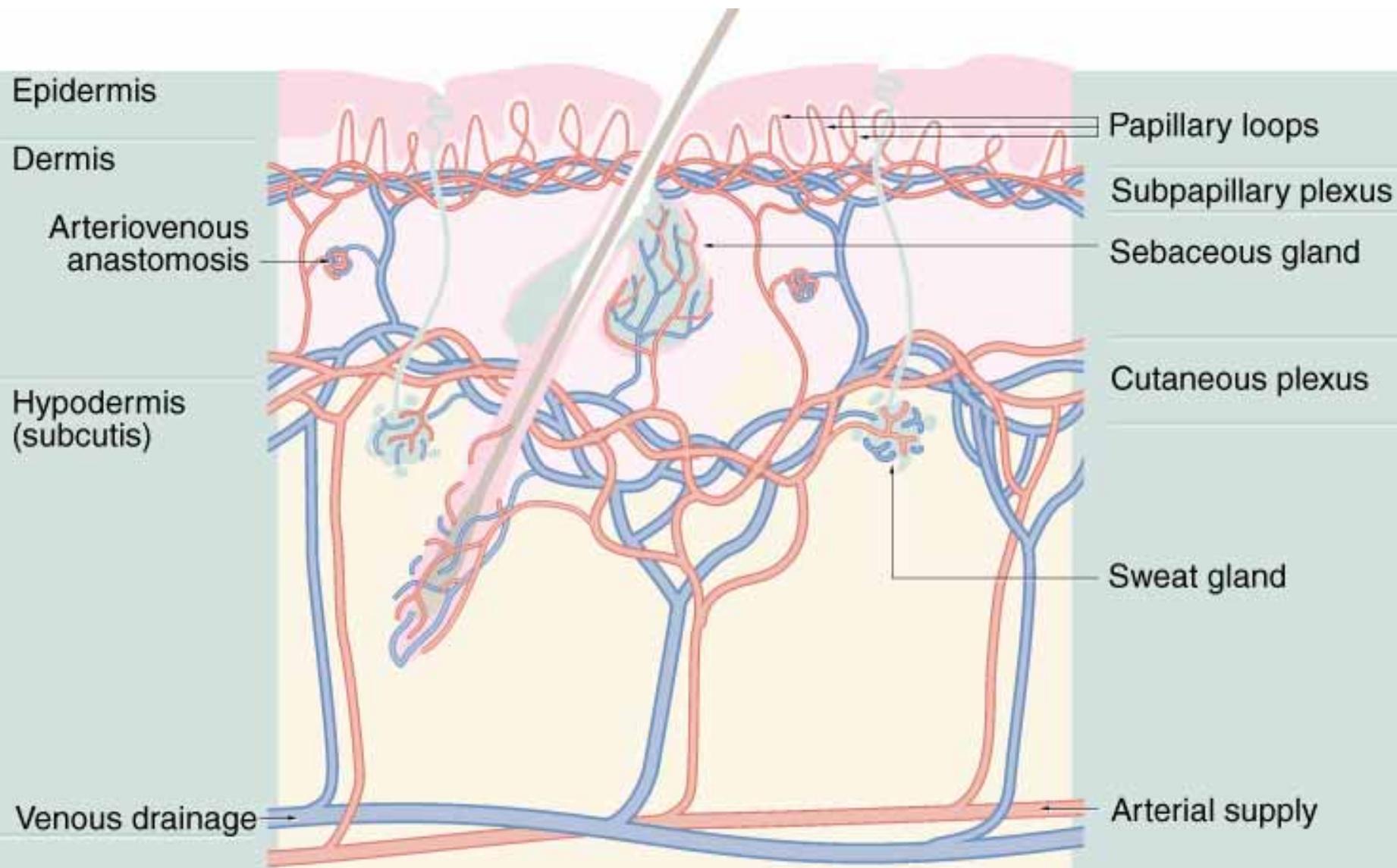
**2** Eosinophils release proteases causing the breakdown of anchoring filaments linking the attachment plaque of the hemidesmosome to the basal lamina. A blister develops.



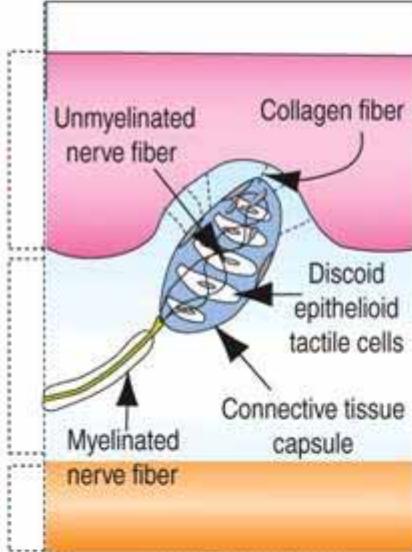
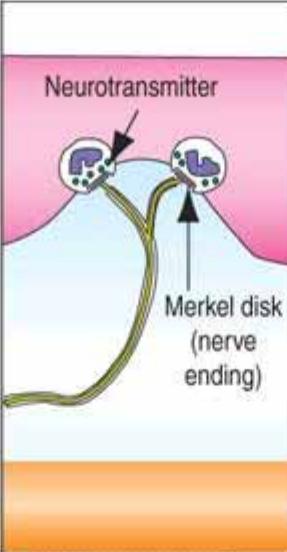
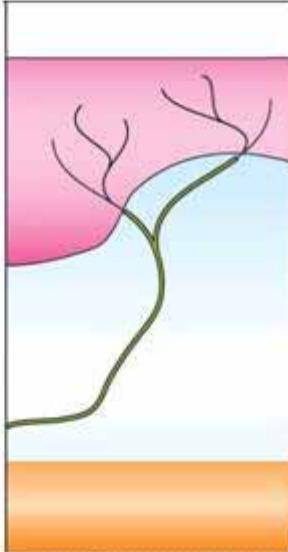
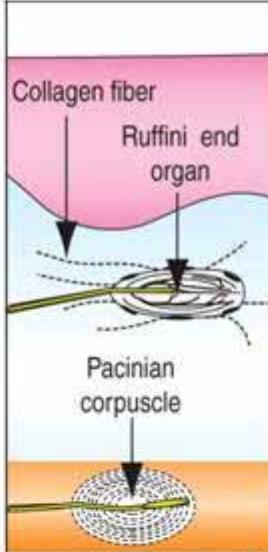
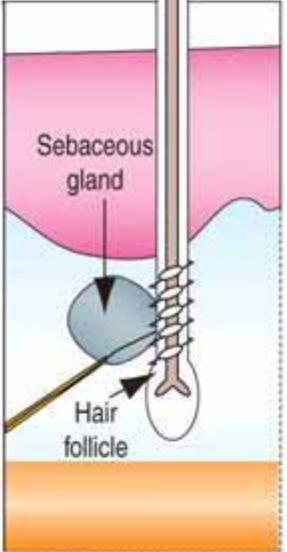
# Skin Appendages

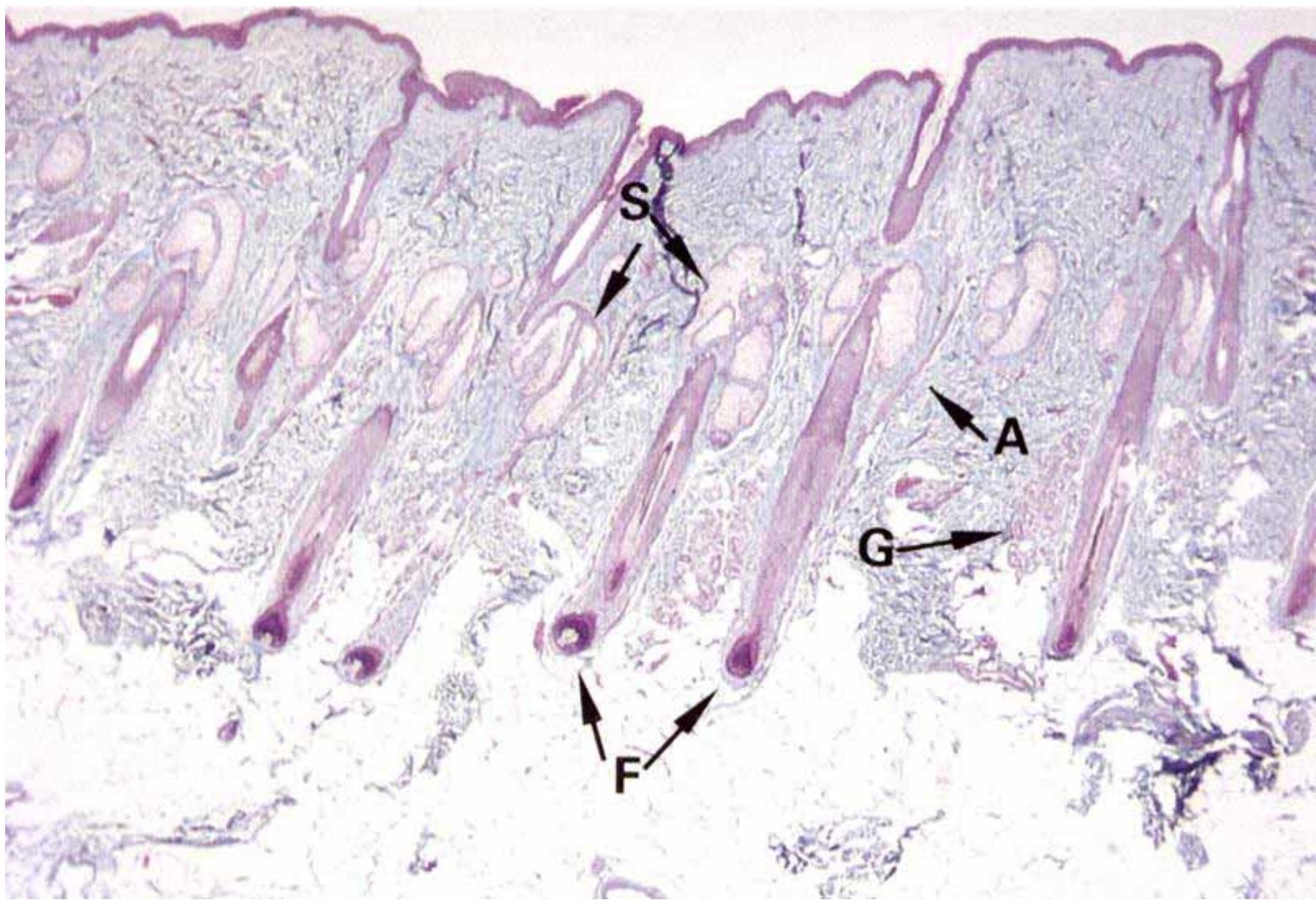


# Circulation



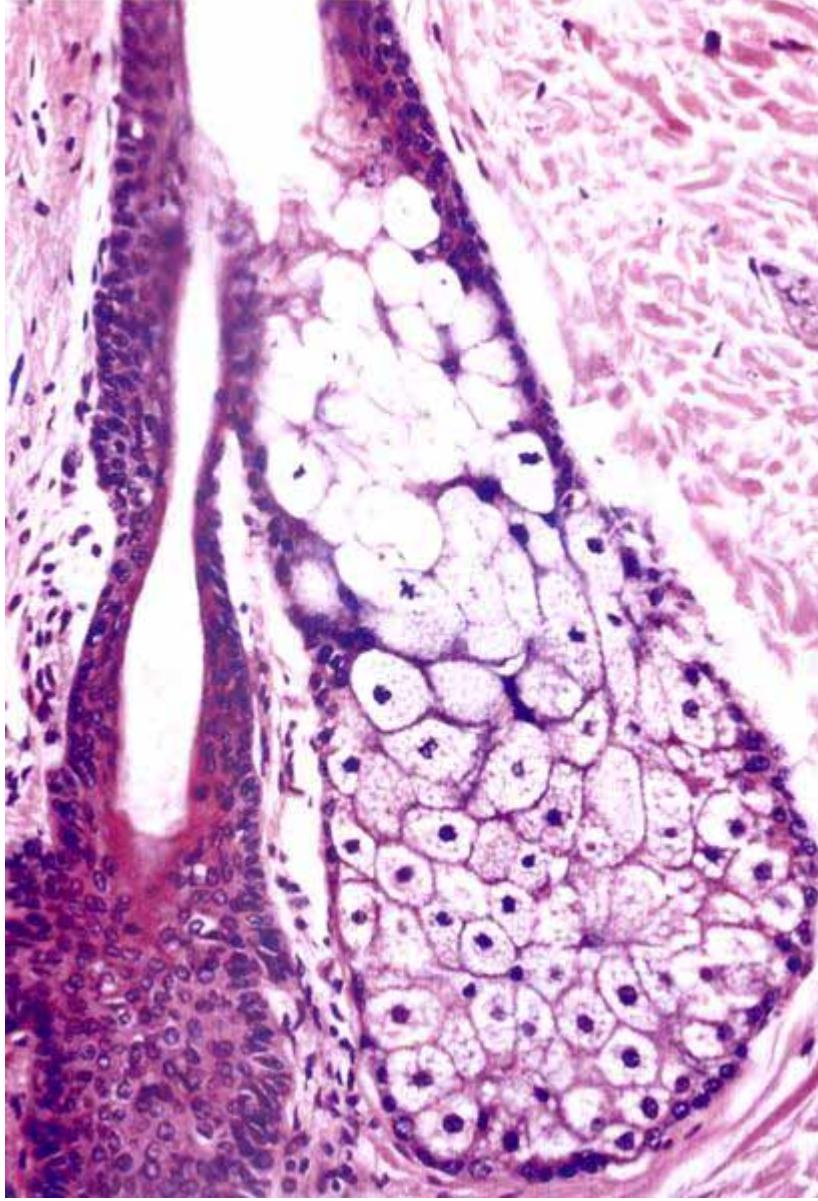
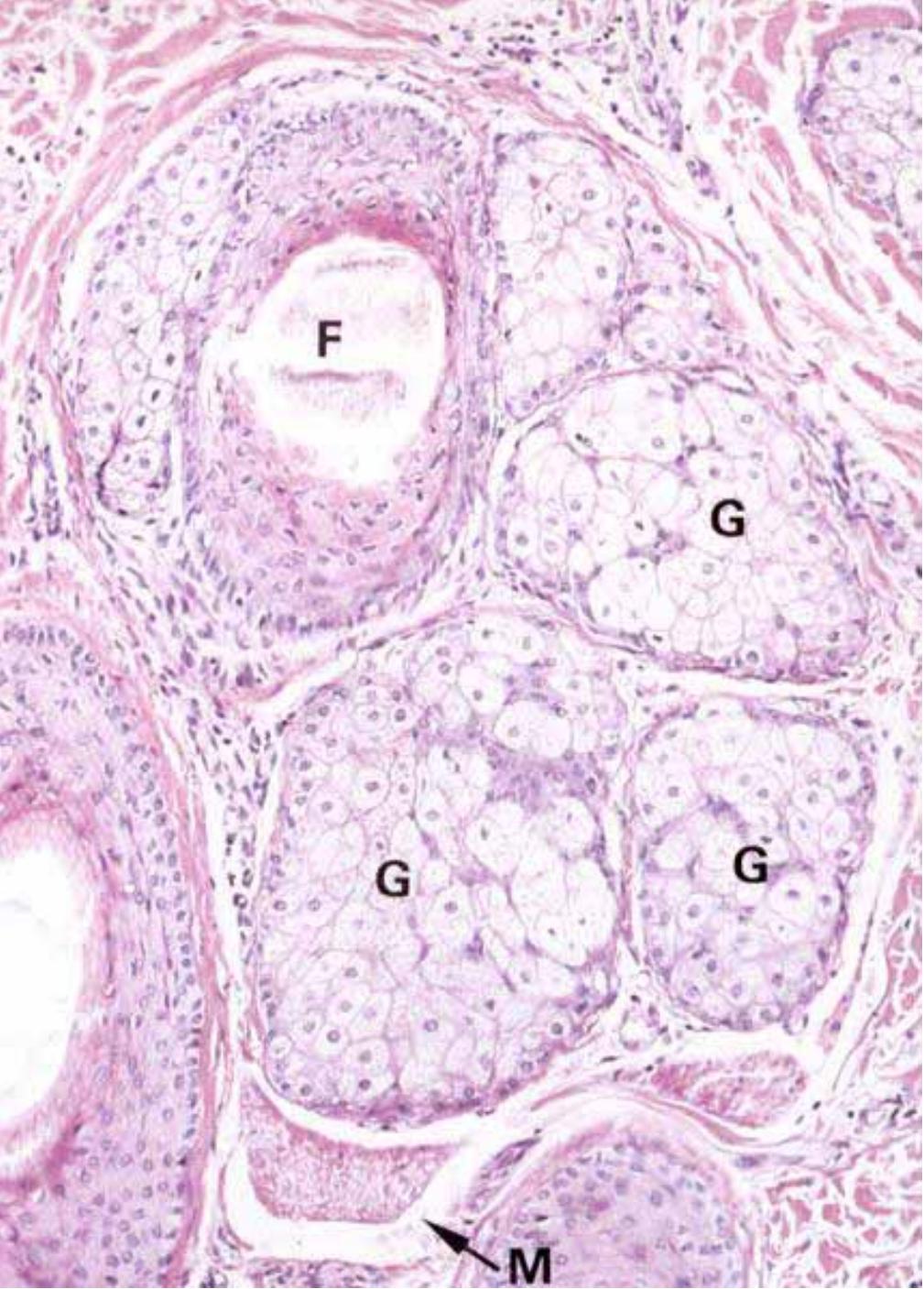
# Sensory Receptors of the Skin

	<b>Meissner corpuscle</b> Present in dermal papilla Tactile receptor	<b>Merkel cell</b> Neural crest-derived cell in the basal layer of the epidermis Tactile receptor (high resolution)	<b>Free nerve endings</b> Lack myelin or Schwann cells Respond to pain and temperature	<b>Ruffini end organ</b> Responds to stretching <b>Pacinian corpuscle</b> sensitive to pressure	<b>Peritrichial nerve ending</b> Nerve fibers wrapped around the base and shaft of the hair follicle; stimulated by hair movement
<b>Epidermis</b>					
<b>Dermis</b>	Present in fingers, hand, foot, front of forearm, lips, and tongue	Present in nonhairy and hairy skin	Found in epidermis and corneal epithelium	<b>Ruffini end organ</b> Present in skin and joint capsule	<b>Pacinian corpuscle</b> Found in hypodermis and deep fascia tissues
<b>Hypodermis</b>					



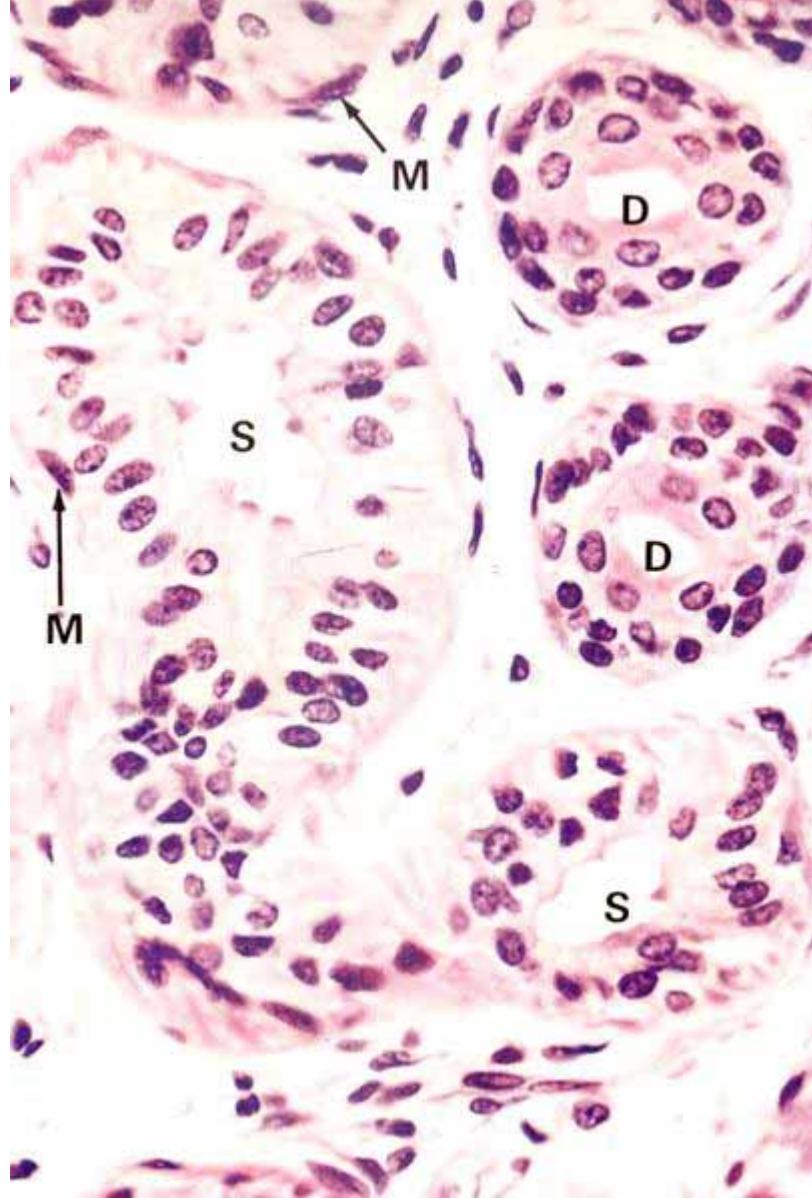
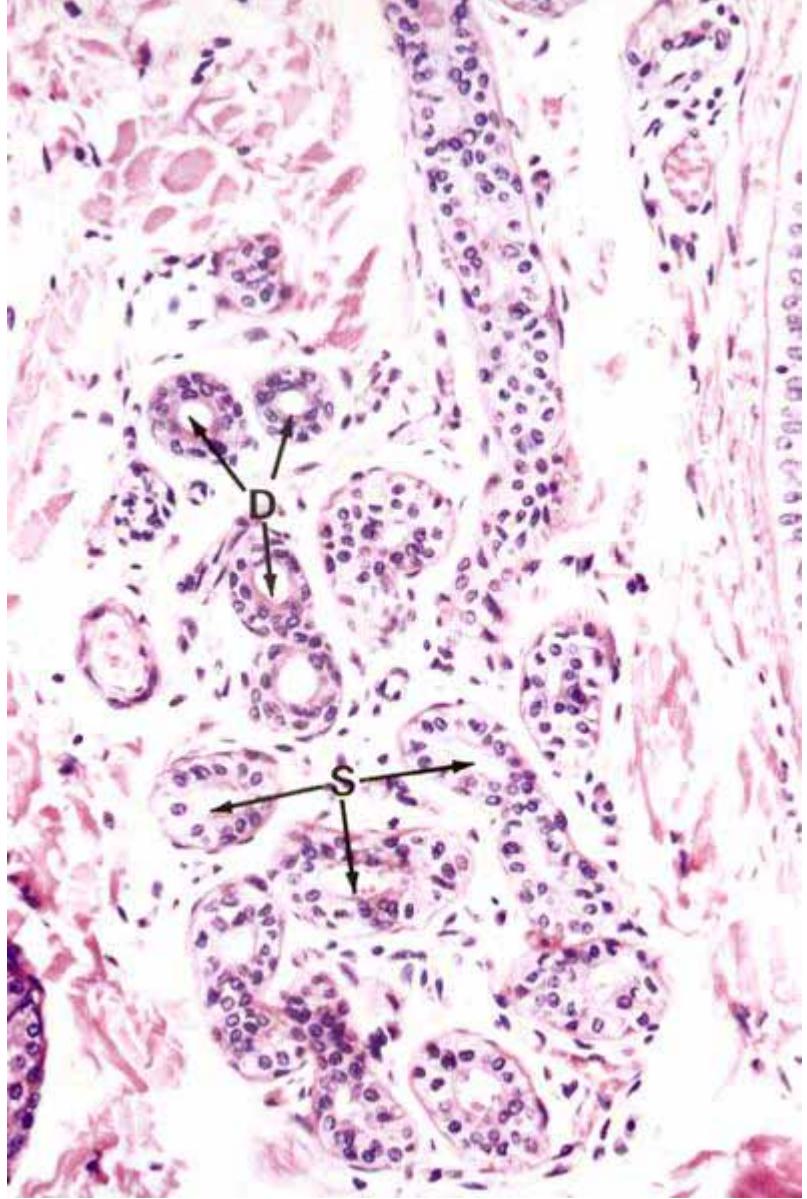
**Scalp**

Wheater's Functional Histology



## Sebaceous Glands

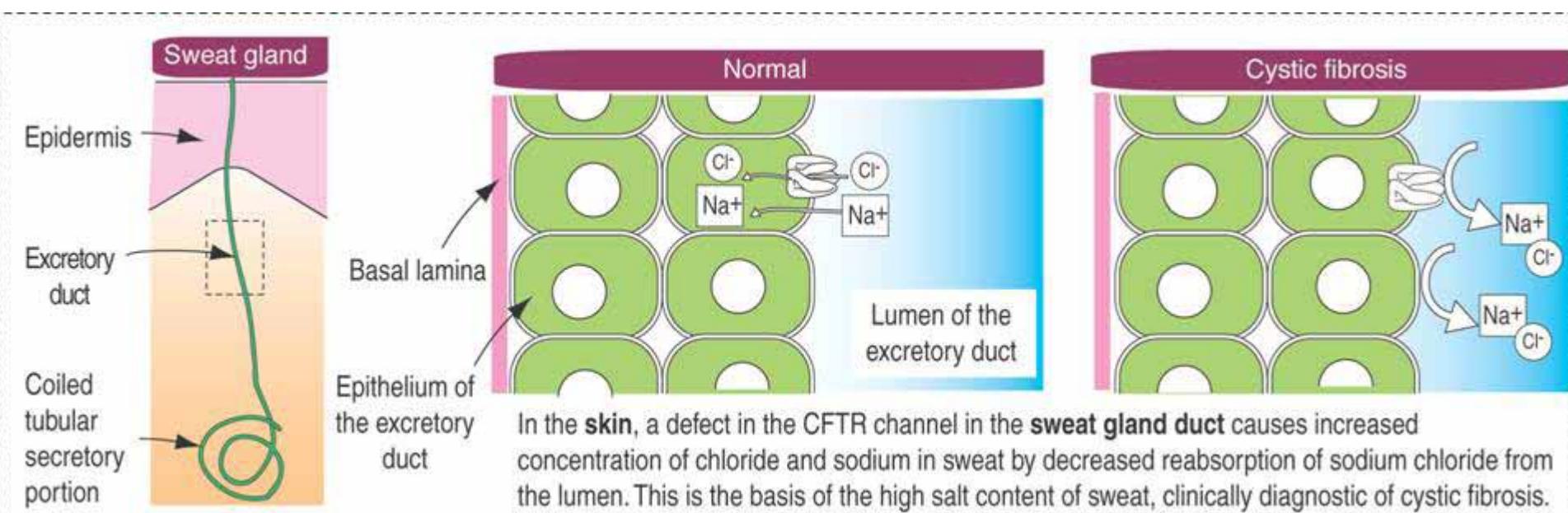
Wheater's Functional Histology



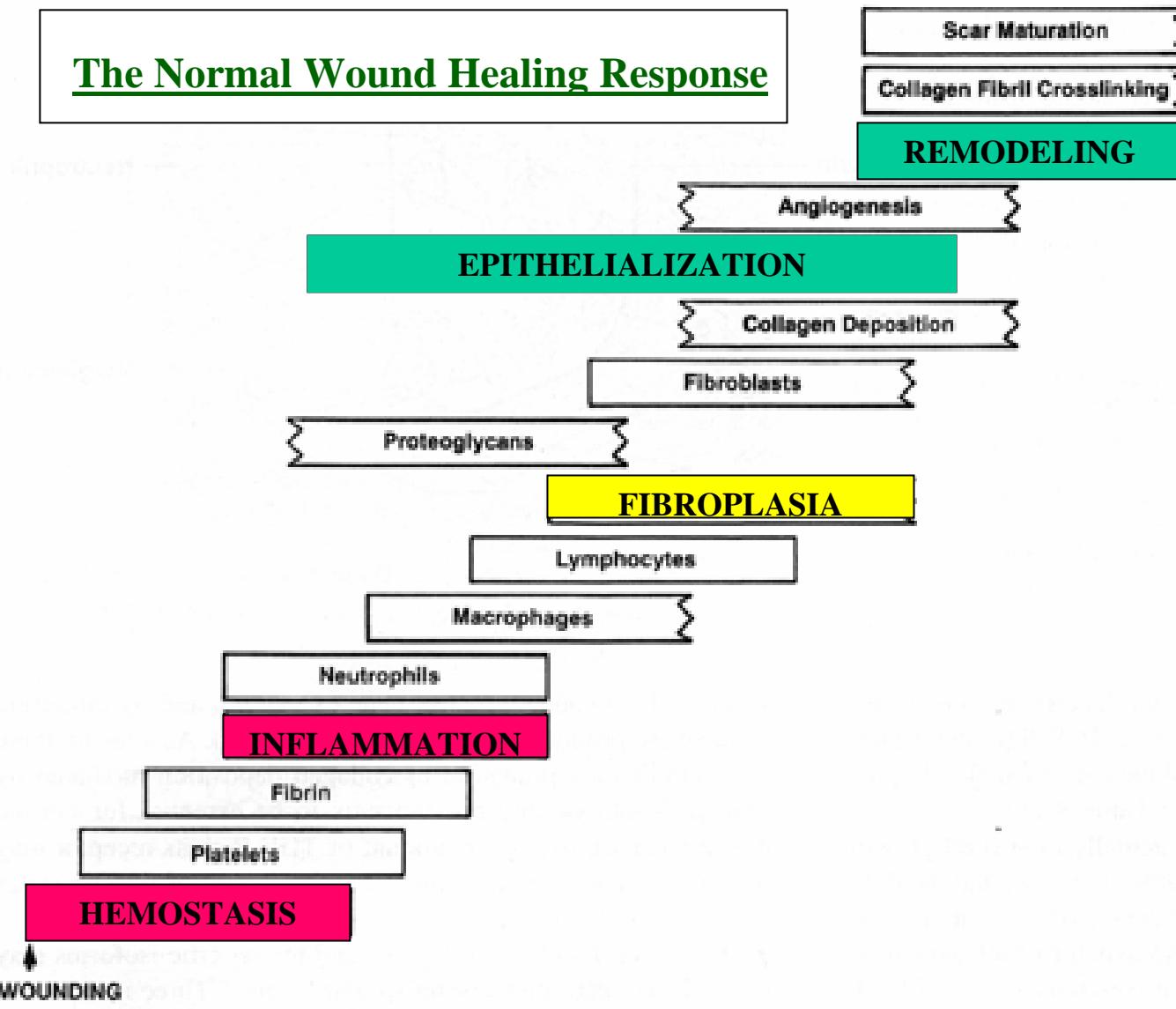
## Merocrine (eccrine) Sweat Glands

Wheater's Functional Histology

## Salty Sweat is Diagnostic for Cystic Fibrosis



## The Normal Wound Healing Response

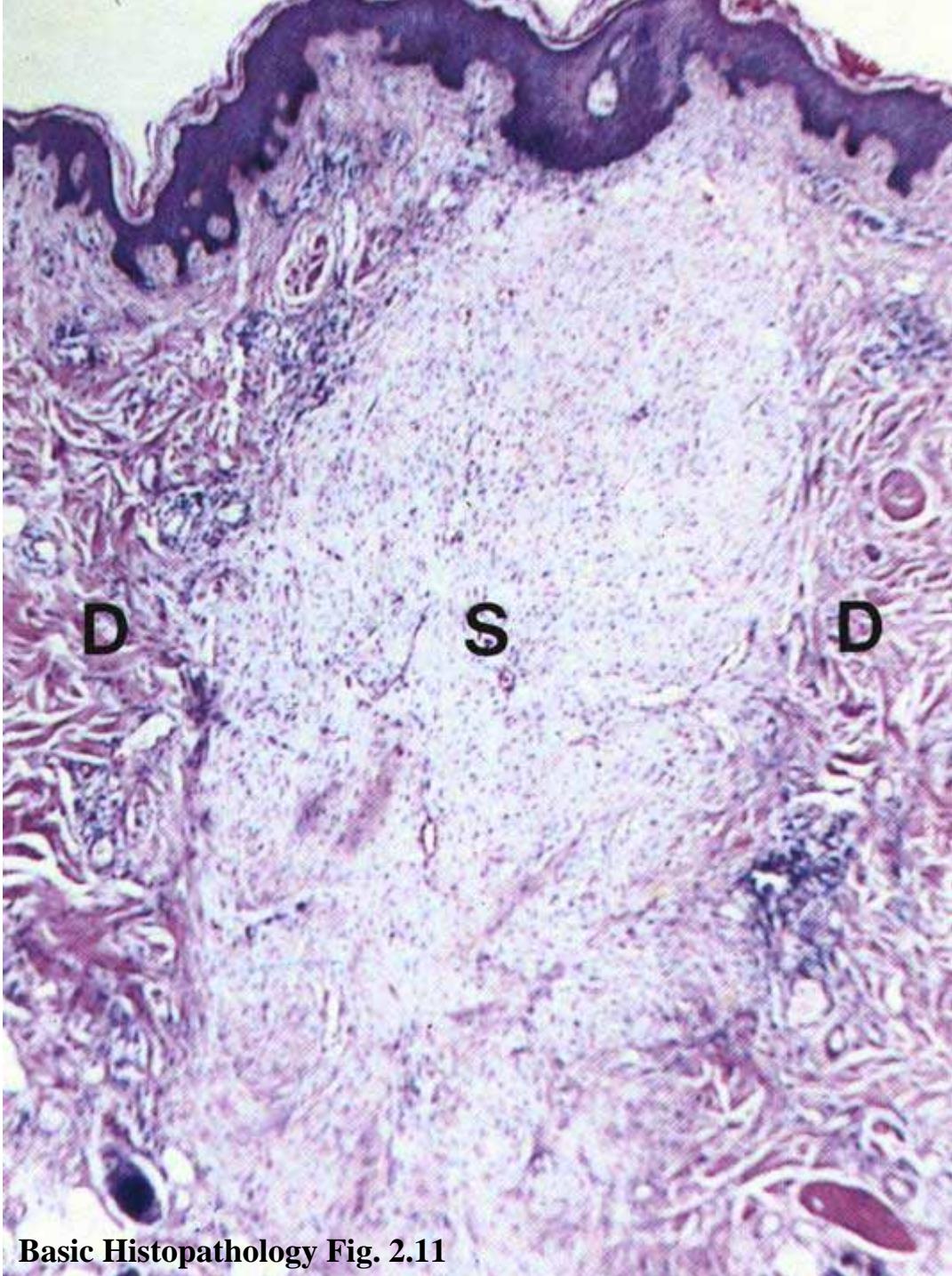


**FIG. 8-9.** Sequence of events in wound healing. (Modified from: Mast BA: *The skin*, in Cohen IK, Diegelmann RF, Lindblad WJ [eds]: *Wound Healing: Biochemical and Clinical Aspects*, chap 22. Philadelphia, WB Saunders, 1992, with permission.)

**Principles of Surgery**

## Skin Scar from Biopsy

- fibroelastic tissue forms scar
- no skin appendages
- progressive reduction in cellularity
- progressive loss of capillaries
- contraction of scar



Basic Histopathology Fig. 2.11

## **REFERENCES**

- 1) Wheater's Functional Histology (2000). Young & Heath, eds. Fourth edition. Churchill Livingstone.
- 2) Principles of Surgery (1999). Schwartz, Shires, Spencer, Daly, Fischer & Galloway, eds. Seventh edition. McGraw-Hill.
- 3) Basic Histopathology (1991). Wheater, Burkitt, Stevens & Lowe, eds. Second edition. Churchill Livingstone.
- 4) Histology and Cell Biology: An Introduction to Pathology (2002). Kierszenbaum. Mosby.
- 5) [medic.med.uth.ymc.edu/edprog/Path/DermII.htm](http://medic.med.uth.ymc.edu/edprog/Path/DermII.htm)